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Space Arms Projects Ignite Debate On U.S.-Soviet Science Exchanges

By WILLIAM J. BROAD

Tensions are rising, because of the development of antimissile research programs, over the exchange of ideas and information taking place among scientists from the United States and the Soviet Union.

The exchanges revolve around nonmilitary matters and are limited to so-called pure, or theoretical, science, according to experts in the United States and Europe.

But a debate is intensifying over whether the meetings should be sharply curtailed. Many of these Russian and American scientists work in military laboratories and their meetings are occurring at a time when both nations are searching for powerful space weapons. These weapons have yet to be perfected and will almost certainly depend for their success on future developments in theoretical science.

Pressure to Curb Meetings

Members of opposing ideological camps are switching sides in this debate. Some Pentagon officials say Soviet scientists could gain not only ideas for exotic weaponry but state secrets as well and want the meetings promptly halted. They are allied in this desire with some liberals who want such "pure science" explorations stopped because they believe they will ultimately escalate the arms race.

On the other hand, different Government officials are allied with conservative weapons scientists, like Dr. Edward Teller, who argue that through discussion and shared research, nuclear weapons, as President Reagan proposed in his speech of March 1983, can be made "impotent and obsolete."

Exchanges of information between American and Soviet scientists are not new. They have been going on for decades. Nor is the concern that such meetings could lead to inadvertent disclosures to the Russians of important military data.

But what is adding special urgency to the controversy is the uncertainty over the ultimate nature of the evolving research, whose American version is formally labeled by the Reagan Administration as its Strategic Defense Initiative and is widely known as "Star Wars."

Major questions have yet to be answered: What types of technology might allow it to work as a vastly complex defensive shield in space that could destroy intercontinental nuclear missiles? Could it be overcome with relatively simple technologies? Could it have offensive uses?

Lines of Battle Drawn Over Scientific Meetings

The dilemma presented by the scientific exchanges is described by Dr. Theodore B. Taylor, formerly an atomic physicist at the Los Alamos National Laboratory in New Mexico, the birthplace of the atomic bomb. "On one level here are two countries facing each other — and it's terrible," he said in an interview. "But on another, here are two sets of scientists sharing a sense that they're both working on weapons for the same reason, to aid deterrence or whatever. And they feel friendly and hand-picked — almost mystically picked. There's a sense of camaraderie. It's curious. It's a matter of shared excitement."

American arms researchers have vigorously protested any attempts to put restrictions on meeting with their Soviet counterparts, saying they profit from Soviet scientific literature and contacts. "We bring back as many good ideas as we leave," said Dr. William A. Barletta, the director of beam-weapons research at the Lawrence Livermore National Laboratory in California, which, along with Los Alamos, is one of two Federal facilities in the United States for the design of nuclear weapons.

"It probably adds to stability," observed Dr. Marshall N. Rosenbluth, the director of the Institute for Fusion Studies at the University of Texas and formerly a physicist at Los Alamos. "The more interaction there is, the less paranoia, and the Russians certainly have shown a good deal of that."

Consequences of Decisions

But others say these exchanges between East and West result from a kind of blind scientific quest, undertaken for its own sake just to see whether breakthroughs can be achieved and without regard to consequences. "It's a mutual advancing of interests between technologists — one that is not in the common interest," said Dr. Richard L. Garwin, a longtime Pentagon consultant who is a former designer of nuclear weapons. "I wouldn't call it a [redacted]. But it takes place out of [redacted] and can lead to the wrong kind of governmental decisions." An example, he said, was how weapons scientists of East and West united to oppose a comprehensive ban on the testing of nuclear weapon in 1950's.

Dr. Charles Schwartz, a physicist at the University of California at Berkeley who is a peace activist, said, "The arms race is in the self-interest of both sets of weapons scientists to the extent that it allows them to expand their budgets and turf." He added that it was easier for Russian scientists to get into the American weapons laboratories than it was for him to do so.

One Pentagon objection to the exchanges has to do with a concern over the possible theft of American military secrets by Soviet scientists who might be acting as intelligence agents. In May, Richard N. Perle, the Assistant Secretary of Defense for international security policy, told reporters that he believed that Soviet scientists visiting the United States were usually either full-fledged spies or legitimate scientists on intelligence missions. There are, he said, "dramatic examples not only of Soviet intelligence officers but of Soviets deeply immersed in the development of some very menacing defense technologies who have come to this country for two and three weeks at a time and had access to the American community of scholars and engineers." He would not provide specific examples. He said, "If it were up to me, I would discourage scientific exchange with the Soviet Union."

Critics of the Research See a CERN Connection

European critics of antimissile research say that collaborations between weapons scientists of East and West extend to powerful particle accelerators. While these atom-smashers ostensibly have application only to pure science, some scientists see them as a potential tool for the development of powerful beam weapons. In articles, lectures and a recent book, Dr. André Gsponer, the director of the Geneva-based Independent Scientific Research Institute, has asserted that American and Soviet arms researchers are secretly working at CERN, the 6,000-person European Laboratory for Particle Physics, which is just outside Geneva. The laboratory has long enjoyed a reputation for pushing back the frontiers of peaceful physics.

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"There is no conspiracy to make weapons," said Dr. Gsponer, who once worked at the laboratory. "There's a lot of good will to study, to understand, to push the technologies to the limit. And this is exactly what the military wants."

One focus of military interest in CERN is antimatter, according to Dr. Gsponer. The laboratory now has the most powerful machine in the world for producing antimatter particles, which are identical to regular particles of matter in mass and spin but have the opposite electric charge. They are also extremely rare.

The military's interest stems from the great energy released when particles of antimatter collide with those of matter, according to Dr. Gsponer. In the fission and fusion reactions of nuclear weapons, only a tiny fraction of matter is turned into energy, from which the weapons nonetheless get their spectacular power. A-bombs or fission weapons split heavy atoms such as plutonium. H-bombs or fusion weapons fuse together isotopes of hydrogen to release some of the energy at the heart of the atom.

But reactions between matter and antimatter produce a complete liberation of energy. It is the only known place in nature where Einstein's famous law on the equivalence of energy and matter (energy equals mass times the speed of light squared) is demonstrated in full force.

A Potentially Powerful Weapon

Antimatter weapons for the destruction of enemy missiles and warheads were one of the possibilities cited by an early Pentagon inquiry into the feasibility of a shield against nuclear weapons. The Pentagon study, completed in October 1983, was headed by Dr. James C. Fletcher, a former Administrator of the National Aeronautics and Space Administraion. "Antimatter beams could provide an effective and highly lethal kill mechanism," the report said.

Dr. Gsponer said weapons scientists of East and West worked at the CERN laboratory on antimatter projects and also met to discuss their findings at international conferences. At Tignes-Savoie, France, he said, a large meeting on the CERN antimatter machine was held in January and attended by Soviet and American scientists, some of the Americans coming from the Los Alamos weapons laboratory.

[redacted] any classified research is ever carried out at their facilities, saying everything must be publishable in the open literature. Dr. Gsponer said this is true, but that the real beneficiaries of much of the research were nonetheless the weapons scientists.

Echoing his view was The Financial Times of London, which recently asserted, "The strongest political case for keeping CERN in business may turn out to be the installation's usefulness as an insurance that European governments can keep abreast of some of the science of Star Wars."

History of Cooperation: Transcending Borders

According to historians and political scientists, the cooperation between weapons scientists of East and West, though seemingly paradoxical, is actually in step with the overall ideology of science. In principle, science is international. Its borders are not meant to coincide with those of nations.

But such ideals are quickly abandoned when governments believe that security risks outweigh scientific benefits, according to Dr. David Holloway, a political scientist at the Center for International Security and Arms Control of Stanford University. For instance, he said, widespread cooperation between American and Soviet atomic physicists in the 1920's and 1930's gave way to separation and secrecy in the 1940's when governments realized the possibility of building atomic bombs.

After the birth of the nuclear era, atomic scientists of East and West slowly began to renew their contacts — sometimes with controversial results. In 1956 Dr. Igor V. Kurchatov, the "father" of the Soviet atomic bomb, gave a frank lecture in Britain on fusion, the nuclear reaction that powers the sun and hydrogen bombs. "He spoke about things that had been classified in the Soviet Union and were still classified in the West," Dr. Holloway said.

The weapons scientists soon united to promote goals that may have conflicted with the best interests of their respective nations, according to Dr. Garwin. An example, he said, was how the "close alliance" between Soviet and American nuclear-weapons scientists in the 1950's and early 1960's became an "impediment" to negotiation of a comprehensive ban on all tests of nuclear weapons. Such a ban would have applied a brake to the arms race. It also would have put the weapons researchers out of business.

Crossing Forbidden Zones

By the 1970's, Soviet and American scientists were cooperating on projects that bordered on classified areas, and sometimes crossed into forbidden zones. One such program was controlled fusion, which attempts to harness miniature hydrogen bombs for the production of electrical power. The tiny fusion reactions are meant to heat water to turn generators. In 1976, American censors tried to retroactively classify a lecture on controlled fusion given at an American nuclear-weapons laboratory by Dr. L. I. Rudakov, a visiting physicist from a major Soviet center in Moscow for the design of weapons. According to American arms experts, he had discussed details that were considered "sensitive."

In the past two decades, arms scientists of East and West have widened their mutual endeavors to include collaborations in such areas as mathematics, plasma physics, lasers and particle accelerators.

Even Dr. Teller, an American nuclear physicist long known for his disparaging views of the Soviet Government, has embarked on collaborative endeavors with his Russian colleagues. In August 1983 he signed a joint agreement with Dr. Yevgeny P. Velikhov, a vice president of the Soviet Academy of Sciences, to set up an international center to study the effects of large-scale nuclear wars on global climate and the development of arms for the destruction of offensive missiles.

Despite a historic rise in contacts, détente has not extended to Russian designers of nuclear weapons, whose identity the Soviet Government tries to keep secret. "We don't even know who those guys are," said Dr. Michael M. May, the associate director of the Livermore laboratory. "I've been interacting with the Soviets since 1970. I'm sure I've met them. But nobody has ever identified themselves as a weapons scientist or spoken about these matters."

Such uncertainty surrounds the work of many Soviet scientists. An example is Dr. Velikhov, whose publicly accessible research focuses on controlled fusion and lasers. American arms researchers suspect he also works on laser weapons.

Nature of Exchanges And the Current Chill

According to Dr. Arthur H. Guenther, the chief scientist of the Air Force Weapons Laboratory in Albuquerque, N.M., occasional ambiguity about the work of Soviet arms researchers does not obscure the overall pattern. "There's no question that it's a community which is made up of people with similar backgrounds and similar interests, and that the technologies involved are common everwhere," he said. "It's also a community in which one is continuously on guard because the areas about which you're talking are sensitive.

"Do we talk physics? The answer is yes. Does the physics relate to things of national interest? The answer is obviously yes. It happens to be the language of our business. And there is a certain amount of parrying back and forth."

Recently Dr. Guenther visited Russia to meet with Dr. Nikolai G. Basov and Dr. Aleksandr M. Prokhorov, physicists who in 1964 shared the Nobel Prize for their pioneering work in the development of lasers.

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According to Dr. Robert W. Seidel, a historian at the University of California at Berkeley who is studying the early days of laser development in both East and West, "soft" intelligence data can often be gathered by American weapons scientists in contact with their Soviet colleagues.

"You offer what you know you can offer," he said, referring to American arms researchers. "The Soviets do the same. And somebody slips. And you learn something quite new. It's a kind of soft intelligence."

But all that may be changing, according to American weapons experts. The recent chill in Soviet-American relations is extending to cooperative science as well, especially areas that touch on technologies for developing an antimissile shield. The quest is sometimes known as S.D.I., after Mr. Reagan's Strategic Defense Initiative.

"With S.D.I. becoming a big thing, it's harder for people to make contacts," said Dr. Rosenbluth of the University of Texas. For both East and West, the perception of security risks is starting to outweigh the allure of scientific benefits, as Dr. Holloway of put it.

For example, Russian scientists recently withdrew a paper on microwave generation scheduled to be presentated at an international conference in Europe. "The Soviets decided it was classified," said Dr. Barletta of Livermore. Powerful beams of microwaves are being studied in both East and West as a way of trying to destroy the delicate electronics of missiles and warheads.

Concern About Secrecy

Dr. Barletta expressed concern over the trend to increasing secrecy, saying both sides benefitted from open communication. "Technology transfer is a two-way street," he said. "I subscribe to Teller's point of view. Aside from blueprints for nuclear weapons, nothing should be classified. If you have a free country and a vigorous country, the price of secrecy is too much to pay."

Lieut. Gen. James A. Abrahamson Jr., the director of the Reagan Administration's Strategic Defense Initiative, recently told a group of reporters that the main particle-beam device at Los Alamos "works because there are three separate Soviet inventions included in that weapon."

Although cooperation between American and Soviet researchers continues unabated in the area of controlled fusion, some arms scientists say it will probably diminish as aspects of this technology fall under the auspices of the antimissile research program.

At the Los Alamos laboratory, one of the world's most energetic lasers for controlled fusion, Antares, is already being evaluated for use by the military. "Recent interest in new defense concepts, such as laser weapons, offers a new potential application for this powerful research tool," the current annual report of the Federal laboratory said.

In the face of widespread collaborations and meetings between weapons scientists of East and West, American officials are instituting new procedures to try to stem the flow of American research findings that might have application to an antimissile shield and other military matters. The Department of Defense, which now finances more than 70 percent of all the scientific research and development undertaken by the Federal Government, has recently tried to close many scientific meetings to foreigners and to set up restricted sessions where security clearances are required for attendance.

The chill extends to exchange programs not linked with the military, an example being the United States-Soviet Union Joint Coordinating Committee for Research on the Fundamental Properties of Matter. James E. Leiss, head of the American delegation and director of High Energy and Nuclear Physics at the Federal Department of Energy, recently signed a research accord with Ivan V. Chuvilo, director of the Institute of Theoretical and Experimental Physics in Moscow.

But Mr. Perle, who is in charge of international security for the Defense Department, has said such exchanges must be curtailed because of suspicions that the Soviet scientists could be spies.

Other arms experts in the United States characterize such attitudes as naïve, saying the exchange of valuable information is a "two-way street." They contend that increasing restrictions on American scientists may only serve to drive the best ones out of weapons research. Dr. Seidel said the ability to speak as freely as possible with scientific peers, wherever they may be found, had a critical effect on "the caliber of people you can recruit."

Some American critics of the Reagan antimissile research are less sanguine about the merits of such East-West cooperation. They argue that the sheer scientific momentum behind the international quest for antimissile weapons could ultimately force their deployment, which would add yet another costly and destabilizing spiral to the already expensive competition between the nuclear superpowers.